traversed. The Kniff patent is a reciprocating rock crushing tool also known as a precussion tool. The loading on such a tool is strictly in compression. The present invention is used

ed on a rotary earth-boring drag bit, which is an entirely different action and loading on the bit element. Drag bits are essentially rock shearing devices as opposed to being rock-crushing devices. The loading on the contact structure and the mounting structure differs substantially between the two kinds of devices. The loading on the Kniff patent is essentially axially while the loading on the present invention is substantially in bending. The diameter of the holding structure in Kniff is substantially smaller and its length is substantially greater making its element relative weak in bending. The Kniff structure would definitely be inoperative if used on a drag bit in light of the substantial moments the contact structure would be sustaining. This is also true as to the threads 38 in Kniff, which are relatively short and would be weak when the loading is perpendicular to the axis. The spatial limitations of a reciprocating rock-crusher and an earth-boring drag bit are substantially different also. The device in Kniff has only one cutting element while applicant's earth-boring bit has many cutting elements that are crowded together in a limited space as shown in Figure 14.

The contact structure in Figure 3 of Kniff is supported by a screw threaded steel ring 34 into which element 16 is pressed fitted. The two threads differ substantially. The thread to Kniff is a cylindrical screw thread while the thread of the present invention is a conical screw thread. Ordinarily, a clearance is provided between male and female threads of mating cylindrical screw threads. Without clearance, assembly of the male and female cylindrical screw threads 15 either very difficult or impossible. Any clearance that is

present between the two threads remains after the two threads have been tightened. The intense side loads that occur on a cutting element, engaged normal to the axis if the threads causes the threads to loosen. When conical threads are assembled tightly, there is no clearance between the threads and the joint is stronger than a pressed fit, which assembly is easy to accomplish. Conical screw threads are typically used for sealing of pipe joints.

With the rotary drag bit of the present invention, it is desirous to have as many elements on the bit body 146, and therefore, the tapered helical thread of the element permits closer spacing of the elements on the body of the bit, which is a clear advantage of the conical thread.

As the hardness of materials increase, the impact resistance generally decreases and therefore, impact tools such as Kniff cannot use cutting materials that exceeds Rockwell 92 on the A Scale. The contact structure of the elements of the present invention are subjected to significantly less impact because they are used on an earth-boring drag bit that maintains nearly continuous contact with the formation being cut. The fact that they are subjected to less impact allows harder materials to be used in the present invention than are used on impact tools such as Kniff.

Regarding the paragraph 6 rejection, under Section 103(a) of claims 8, 9, 31-36 and 38-40 as being unpatentable under Kniff in view of Evans is respectfully traversed for the reasons stated above, along with the following. The Evans patent involves a rolling cone bit, which again is a different cutting action from that of a drag bit of the present invention. As the Evans bit is rotated against the bore face, rollers 11 freely rotate on their bearings, thus forcing the cutting elements 30, 40 and 50 directly into the rock face, which is a compression loading as distinguished from drag bits like the present invention. The only

cutter in Evans which functions as a drag bit is a gauge cutter 50 and this cutter has a clearly different configuration than the tapered cutters of the present invention wherein the harder material in the center does not have a cutting tapered structure surrounding it. Without the tapered structure, this element cannot cut chips of any size and it has little in common with the cutter of the present invention. The only cutters in Evans which have a tapered surrounding structure are cutters 30 and 40. which are essentially rock crushing devices rather than drag bits as is the present invention.

The present invention has a small rounded tip structure that enables it to avoid excessive-heat making it suitable for use in earth-boring bits. The present invention exploits the relationship between the differing hardness of the two materials to maintain the capacity for stress concentration at its contact point. When the cutting geometry is maintained, the cutting efficiency of the cutting element is maintained. It teaches a self-sharpening bit as opposed to a slowly wearing flat bit. The present invention can tolerate much more wear than a rolling cone bit such as Evans without any significant negative effects and at the same time is able to effectively utilize materials that are not as expensive or as hard as diamonds while maintaining cutting efficiency.

The cutting elements of the Evans patent and the present invention, both utilize an element of harder material, but otherwise differ substantially both in the form and in use from the cutting elements of the present invention.

Regarding the paragraph 7 rejection, claims 41-43 under Section 103(a) as being unpatentable over Kniff and Evans, and further review of Drake is respectfully traversed for the reasons stated above and as follows. Drake like Evans and Kniff, are not removable elements as presently claimed and must be discarded with the entire roller cutter 11 as the

elements wear. Cutting elements 21 in Drake are friction welded as described in Figure 4 and cannot be removed.

Applicant's new claims 51-64 are all limited to replaceable cutting elements in a drag bit, neither of which Evans or Drake teach. While figure 3 of Kniff teaches a removable element, it involves a percussion or impact bit, which is considered a totally different design outside the scope of drag bit technology, which would be inoperative in drag bits.

Independent claim 51 is generic to species shown in figures 10, 11, and 12.

Independent claim 59 reads on figure 11 and clearly defines a mounting structure including a conical helical screw thread which is not shown or anticipated in any of the prior art of record.

Independent claim 61 reads on figures 4, 5, 10 and 12 and is novel for the reasons stated above.

Respectfully submitted,

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I here certify that this correspondence is being Faxed to Examiner John J. Kreck at (703-872-9326) Art Unit 3673, at the Patent and Trademark Office, Washington, DC 20231 on 12/03/02

Jean Stahl

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